

Chapter 6

At The Crossroads

We met at Union Station on the cold gray Sunday morning of April 28, 1946, more or less prepared to ride the train across the country to San Francisco, where we would board the *USS Wharton* for the voyage to Bikini Atoll in the south Pacific. In addition to myself, there were the staff of the Ship Protection Section of Preliminary Design: LTC Dave Savaker, Henry Cochrane, Woody Armstrong, Charlie Ksanda, and Ken Lovell. With us were engineers and technicians from other parts of Buships, mostly strangers whom we would get to know well in the next six months. Forty or fifty strong, the Buships contingent to Operation Crossroads left Washington knowing little of what was to come.

Our son Chris had been born just three weeks before. Dee Jay was about to take him to New York City to stay with her mother and grandmother while I was gone. We had rented 117 Winchester Way to a military couple for five months. These changes in our life had occurred in rapid-fire fashion. I boarded the transcontinental train somewhat disoriented. I had traveled the Washington-New York route many times while I was courting Dee Jay but never overnight. The Buships contingent took up several Pullman cars that were our home for six days. These cars stayed together and were shunted from train to train as we went across the country. I remember being astonished at the hour after hour sameness in the landscape after we crossed the Missouri and headed west on the Great Plains. I also remember the magnificent vistas as we wound down the Feather River gorge into California. Otherwise, my first crossing of the country was not memorable in retrospect. The train pulled into Oakland and we were shunted into the Army Base and onto the pier next to the *Wharton*.

The *USS Wharton* was a large troop ship, a former passenger liner. We were given comfortable staterooms and the amenities were pleasant. There was a large dining hall or officers mess and a lounge with large windows overlooking the ocean when we were at sea. At the time we went aboard, the windows overlooked the harbor with San Francisco looking gorgeous across the Bay. We never got over there. There was time for one evening being introduced to Dungeness crab in Jack London Square before the ship left for Honolulu.

During the first week at sea, we spent hours being briefed on atomic bomb effects as they were known in these first months of the nuclear age. We also worked on our plans for the upcoming tests, the first of their kind. In a way, the regimen we followed was a continuation of the planning that had been going on ever since I joined the Crossroads planning group in February. There were to be two test explosions of bombs similar to those exploded over Hiroshima and Nagasaki, one high in the air like those used in wartime and one underwater near the bottom of Bikini lagoon. The air burst was scheduled for July 1, the second three weeks later. We should be back home by Labor Day.

Since the war was over, the Navy felt it had a lot of surplus vessels that could be used for the tests. These, of course, were older ships. There were some captured German and Japanese warships as well. The planning of the target array was pretty well completed when I showed up.

The central target of the array for the air burst was the battleship *Nevada*. Around her within about a thousand yards were about twenty other ships, including the Japanese battleship *Nagato* and cruiser *Sakawa*. Outside this rather crowded central area were ships arranged like spokes of a wheel, each spoke made up of ships of the same type: two spokes of troop ships (APA), one of destroyers (DD), and three of landing craft (LST, LCT, and LCI). All this was arranged to expose the various ship types to a complete range of blast overpressures from the burst. Our job was to install measurement devices, take photographs, and analyze the results. I was elected to write the report on blast damage to ships.

When the *Wharton* arrived in Honolulu harbor, I found Hawaii to be everything I had imagined it to be. The war had been over for nine months. The big crush of returning servicemen was over. There were still some troops at Fort De Russy, the big R&R facility on Waikiki Beach, but the island was returning to normal. During the week at sea, we had become friends with the naval officers, mostly Commanders, with whom we were going to work. Among them was John "Muddy" Waters, whom I found most congenial. There was apparently a surplus of jeeps on the island, for Muddy never was without one. We explored Waikiki. Beyond Fort DeRussy, there were just two hotels on the beach—the pink Royal Hawaiian and the white Moana with its famous banyan tree. These days Waikiki has beach hotels cheek to jowl but not in 1946. I was enchanted by the palm trees, the white beaches, the warm tropical air, and the ceaseless surf. We toured the island of Oahu up the Pali road to the precipice where Kamehameha slaughtered the local warriors, then down a tortuous nerve-wracking set of switchbacks to the windward side of the island. Hawaii was my kind of place.

A luau, a Hawaiian picnic feast, was put on for the members of Joint Task Force One, as the Crossroads organization was called. I discovered that many jazz musicians and swing-band sidemen had been drafted by the services and put to work entertaining the troops. Apparently they were not being let out of the service early as I heard some of the best jazz and swing on Hawaii I had heard since the days of Tommy Dorsey and Benny Goodman at the Paramount. All too soon, the flotilla pulled out and headed for Bikini atoll, a week or more away.

Eight days later, we approached some low-lying islands protected by a reef marked by high surf. Threading our way through a pass in the reef, we entered Bikini lagoon. There was our target fleet and far beyond near the horizon were more low-lying islands. Bikini atoll was the top of an undersea volcano, the rim of the crater forming a nearly circular ring of islands and coral reef. There was plenty of room in the lagoon for the target array and the flotilla of ships carrying the test personnel. The *Wharton* anchored to the north of the target array near the *USS Haven*, the flagship of Admiral Blandy, commander of Joint Task Force One. It was early June and we had about three weeks to get ready for the air burst, Shot Able, as it was called.

The target array was pretty much in place when we arrived. The battleship *Nevada* stood out in the center because it was painted bright red. The remainder were the usual "battleship gray." Each day we boarded a motor whaleboat at the *Wharton's* cargo door and visited the various target ships to install scratch gauges and other devices to measure the movement and distortion of the ship's structure by the blast and shock of the atomic explosion. Army teams were installing various pieces of equipment and supplies on the decks of the ships to be exposed to the blast. Medical teams were tethering animals for the same purpose. Each target ship had a small

contingent of the crew left on board to help prepare for the test. They would be taken off, of course, the day before the shot.

One of our favorite stops, especially at lunch time, was not a ship but a huge floating dry-dock that had been towed out to Bikini for the test. The huge walls of this contraption contained shops, galley, and bunkrooms. The crew consisted of a chief and eight seamen, who always welcomed us with open arms. One of the attractions on board was booze. Not being a commissioned warship, the floating drydock was not subject to the ban on alcoholic beverages aboard Navy ships. But it was not the prospect of a luncheon Martini that drew us to that concrete box. It was the food, which was plentiful and excellent. The menu changed every day and challenged one's taste buds.

Woody Armstrong and I sought out the seaman cook and voiced our appreciation. He smiled with delight and proudly showed us the huge walk-in freezer with meats of every kind and his bulging pantry. "Where do you get the recipes for the food you prepare?" I asked. He showed me a big official Navy cookbook. "But all these recipes are for 50 servings. How do you reduce the ingredient amounts for a crew of nine?" "I don't," he replied, "I just make it as it says to." I could see why we were always welcome. "What do you do with all the leftovers?" "I just throw it over the side," he replied.

In the tropical evenings, the motor whaleboats converged on the beach at Bikini Island, the largest of the ring of islands that formed the atoll. Ashore was an officers club and an enlisted mens club where the tax-free liquor was cheap and the camaraderie noisy. I have several mementos of those nights on the beach. One is an imitation dollar bill printed somewhere in the fleet that says "ATOMIC Short Snorter" on one side and "BIKINI", "JTF ONE", and "CROSS-ROADS" with a ship at sea on the other. This continued the World War II tradition of getting your buddies' signatures on a dollar bill. There are 21 signatures on my short snorter.

A second memento is a card that designates me "having been proven of sound mind, good fellowship, and fidelity to the Brotherhood, a Charter Member meriting full honors and prerogatives of the Bikini Wednesday Night Chowder and Marching Society." Finally, I have the base of a large conical shell that I found on the ocean side of the island, which I used as an ashtray back in the days when I smoked.

Shot Able

At last the day arrived for the first nuclear explosion after World War II. It was June 30 or July 1, depending on which side of the International Date Line you believe Bikini Atoll is located. I have seen both dates in various official documents.

The *Haven*, *Wharton*, and the rest of the support ships had left the lagoon the previous afternoon. Morning found the flotilla in position about 8 miles from the target array in Bikini lagoon. The shot was scheduled for 9 am and, from breakfast on, the bullhorn was giving out orders and advice on how to behave when it happened. There would be a brilliant flash of light that would destroy one's eyesight if one looked at it. Sunglasses were not enough. Special dark

sheets of glass or plastic were distributed for viewing the explosion. I decided to turn my back and not watch the initial phase.

As the moment approached, several aircraft were circling the target array, perhaps taking photographs. The bullhorn began a countdown: "Ten minutes to shot time. Ten minutes." At about one minute, someone pointed out the bomber, a B-29, coming in from the east at 30,000 feet. The bullhorn started a countdown by seconds. I turned away from the deck railing and faced the bulkhead. The countdown had not quite reached zero when the dark gray of the bulkhead suddenly disappeared in a brilliant flash of light. The flash immediately vanished, then grew again more slowly to brilliance. I could feel the heat on the back of my neck. After what seemed an eternity but was actually only a second or two, the heat on my neck diminished, the light lost its brilliance and I slowly turned around and looked toward the lagoon.

A dark roiling cloud several thousand feet above the lagoon was partially obscured by a layer of white cloud extending out well beyond the explosion cloud, which was rising rapidly into the sky. Very soon it was much higher than the B-29 bomber had been and was expanding into a mushroom-like cloud with a long stem leading back to the site of the detonation. The horizontal white cloud had quickly disappeared (it was caused by the shock wave condensing the moisture in the sea air.)

All this occurred in absolute silence except for our own exclamations of awe. We watched in fascination for perhaps 30 seconds. Then we saw a darkening of the sea a mile or two away that was rapidly approaching us. I knew what it was. "Here it comes!" I cried. Then it was on us with a boom and a roar and a sharp whack on the ship's structure. The blast wave had arrived at our position eight miles away from the detonation.

The target array could not be seen well from 8 miles out but somebody with binoculars said that the bright red *Nevada* was still there. There was smoke from fires at several points in the target area. Aircraft appeared and buzzed the target ships. Soon the bullhorn announced that a merchant type, the APA *Gilliam*, and the destroyer *Anderson* had been sunk. We quickly consulted our charts of the array. It seemed that the bomb had missed its target, *Nevada*, by at least 1000 feet. Shortly, the sinking of another APA further out was announced. So the miss may have been more than 2000 feet. There were the inevitable snide putdowns of the Army Air Corps: "So much for 'pickle-barrel bombing!'" and the like. What we didn't realize was that the atomic bomb, called the *Fat Man*, was almost 11 feet long, 5 feet in diameter, and weighed almost 10,000 pounds. The bomb casing ballistics were abominable because the "California Parachute" tail fin assembly was quite primitive and inefficient. The bombardier in the B-29 really didn't know what trajectory that early atomic bomb would follow.

Later in the day the test area was declared all clear and we returned to our anchorages to the north of the target array. We could see some of the spectacular topside damage as we passed by the target ships. The small carrier *Independence* had her island virtually swept overboard and the Japanese cruiser *Sakawa* was smashed into an almost unrecognizable mess. During the next days and weeks, we made a careful survey of the damage, collected the records from the measuring devices we had installed before the shot, and set up new ones for the upcoming under-water

burst. As we toured through the array, we managed to stop, more often than not, at the concrete drydock, which fortunately had survived Shot Able.

Shot Baker

After three weeks of hard work gathering data from the air burst shot, respotting the target ships in a new array, and instrumenting them for the underwater burst, shot day was upon us. We had exited the lagoon the night before and morning light found us barely underway about five miles east of the atoll. There was no need for smoked glass for viewing as the explosion would be buried under more than 200 feet of water in the lagoon. The weapon had been armed during the night and was now suspended on a cable below a small landing craft. It would be detonated by a radio signal from the flagship.

We crowded the rail of the *Wharton* as the countdown began. I had little idea of what I was about to see. Over there in the lagoon were the target ships, looking like toys halfway to the horizon. “10 . . 9 . . 8 . . “ As the countdown went to zero, the lagoon bulged with suppressed light, then a huge white column shot skyward. A darker mushroomlike cloud appeared at the top of the column, perhaps 5000 feet up, and expanded outward. The white stem of the mushroom was perhaps a half mile across. There was a dark streak near the right side, which I determined later was a hole in the column where a major warship had been.

After what seemed to be minutes, the column began to collapse back into the lagoon. Tiny plumes pointed downward emerged from the white wall of water like chicken feathers. As the column collapsed, a mist boiled up from the base just like the mist at the foot of Niagara Falls. The mist expanded outward rapidly, engulfing one target ship after another. Up above, heavy dark plumes emerged from the mushroom cloud and plunged into the expanding surface mist. We oh’d and ah’d as this tremendous eruption occurred and exchanged excited comments with each other. About 15 minutes or so after the detonation, the mist had lifted and merged with the remainder of the mushroom cloud and was soon lost in the other clouds in the sky. The big show was over.

Well, not quite. We tried to inventory the targets. The bomb barge, an LSM, was gone. Also, we could not find the old battleship *Arkansas*. It had been about where we saw that dark hole in the white column of water. The bullhorn announced that the *Arkansas* and another landing craft had been sunk. The aircraft carrier *Saratoga* was low in the water and listing to starboard. The bullhorn announced that salvage tugs were going to enter the lagoon to try to beach the *Saratoga*. An hour later, it was announced that the lagoon was too radioactive for the tugs to get near the aircraft carrier. We started betting whether the *Saratoga* would sink or not. She was a bit lower in the water but still afloat. My pals from the Ship Protection Section all said she would stay afloat because it was now hours after the explosion. I said she would sink. About noon she went under.

What Goes Up Must Come Down

We sat around after lunch exchanging astonished recollections while the bullhorn relayed confident messages that expert teams were probing into the lagoon to determine if it was safe to

reenter. After awhile, it was announced that the water in the lagoon was too radioactive to reenter. We would stay outside until tomorrow.

The next afternoon we finally reentered the lagoon and took a position further to the north than our earlier anchorage. We were a day behind schedule. The schedule had been set by the task force commander, Admiral Blandy, based on the advice of his technical staff. We had a week to gather our test data from the various target ships and then we would leave for home. The next day the radioactivity in the lagoon water had decreased so that boats could safely traverse the target array. Then it was discovered that most of the target ships were highly radioactive. It was clear that we were not going to board those ships any time soon.

We sat around in the wardroom of the *Wharton* and groused. Why hadn't those technical advisers anticipated this? They knew how much radioactive material was produced by the explosion. They also knew most of it would be vented upwards in what was now called the cauliflower cloud. Didn't they know that what goes up must come down? I asked the rhetorical question and we all damned the radiological experts who had failed to predict this delay.

The next day the official explanation for the unforeseen radiation hazard on the target ships was passed around. The problem was the "base surge," that mist that formed as the water column collapsed and that gradually enveloped most of the target array. The base surge had not been predicted by the experts, so it was responsible for the unexpected delay.

There were two ways to reduce the radiation hazard on the target ships. One was to wait for natural "radioactive decay" to reduce the radiation levels. That would take weeks. The other way was to decontaminate the exposed surfaces of the ships: scrub off the radioactivity and wash it into the lagoon. After a few days, that was tried. It didn't work. The radioactive material was securely fastened to the paint. July became August. Woodie Armstrong and I, with nothing else to do, decided to grow beards. The support crews tried sandblasting. That helped but it was slow. But radioactive decay was working and gradually the target ships were boarded and the data and equipment retrieved. Finally, in late August, we left Bikini Atoll for Hawaii.

Why I Don't Buy Japanese Cars

While we were laying over in Honolulu a few days, I had an experience I will never forget. CDR John "Muddy" Waters asked me if I wanted to go with him to Schofield Barracks, the big Army Base out in the valley between the two mountain ranges of Oahu. It seems that he had an older brother, a Marine, who was killed on Guadalcanal. His body was at the Graves Registration Service facility at Schofield. Muddy's parents were in the process of deciding whether to have their slain son buried at Punchbowl National Cemetery on Oahu or brought home for burial. Muddy had promised to look for his body. I agreed to go with him and off we went by jeep.

The Graves Registration Service facility consisted of a half-dozen huge warehouses. It was Sunday and the only staff person on duty was an Army captain who, it turned out, was a PhD anthropologist. There was a distinct smell of booze as the captain listened to Muddy's request. He nodded, consulted a box of file cards, and said, "Follow me, please." We walked to the end warehouse. As my eyes adjusted to the dim interior, I saw caskets on both sides stacked nearly to

the roof and extending the full length of the warehouse. There must have been several thousand caskets. Our guide consulted the file card representing Muddy's brother. On the left hand side about two-thirds of the way along the aisle, which was wide enough for a forklift to maneuver in, and fourth high in the stack, he identified the casket with the proper tag.

"This is your brother," he said, "You may be confident of it." In explanation of this comment, he added that in many cases the remains of the deceased came in parts, often mixed up with the parts of others. "We of the Service have perfected the technique of assuring that all the bones in a casket belong to the same individual and that the individual is positively identified. The Service takes great pride in guaranteeing this," he said. We muttered appreciation.

"What do you do about the bones you can't identify," Muddy asked. "Come with me," replied the anthropologist. He led us to another of the warehouses. We stepped inside and he turned on the lights. Covering the floor were a large number of folding tables with sheets over them. He removed one of the sheets. The table, about twelve feet long, was filled with skulls, 50 or more of them. He picked up one of the skulls. "This group is from the *Oklahoma*. This skull is of an older man. I'd say maybe 42 to 45, perhaps a chief petty officer. I can compare these upper teeth with the likely dental records to identify the individual. Then, I can locate the lower jaw from the next table and so on. The records will give me height and weight and other features so that I can assemble the complete skeleton and certify that all of it is of that individual. Then we can notify the next of kin."

The anthropologist became loquacious about the virtues of his job. He was engaged in important research to improve the Bertillon system of identification of skeletal remains. He saw more remains here in a week than he could in a lifetime in a stateside hospital. I looked out over the scores of sheeted tables and thought of all the lives sacrificed that were represented there. We said our goodbyes and left. I think I know why the anthropologist drank on Sunday morning.

The Homecoming

The rest of the trip home was notable mainly for its slowness. I kept myself busy by starting to write an article on the impact of the atomic bomb on naval warfare. I thought I might send it to the Naval Institute for publication. Woody Armstrong and I, who had become good friends, nurtured our beards, trimming them daily. My beard was a squared-off Pennsylvania Dutch type, which I thought looked great. It made me look more mature.

When we pulled into Washington's Union Station, I was delighted to see DeeJay among the waiting crowd of relatives. She looked gorgeous and I realized that I had really missed her. I was among the first off the train. Running to her, I lifted DeeJay off her feet and kissed her hungrily. After that one kiss, which she returned, she pushed me away and demanded, "What on earth is that?" "It's a beard," I replied. On the way to the hotel, she bought a razor at a drugstore. After we were in the hotel room, she sat me down in the bathroom and proceeded to shave off the beard I had been nurturing for months. Only then did she take me to bed.

The next day we checked that our home in Falls Church would be available to us and then took the train to New York to reclaim Chris from Mother and Grandmother Rice. Chris was a

delightful five-month-old in place of the weeks-old infant I had left in April. That night he awoke twice and was quieted quickly by the insertion of a bottle in his mouth. In the morning I asked why he still needed to be fed during the night and was informed that the bottle contained only warm water. "We couldn't let him annoy the neighbors by crying at night," explained the grandmother. Back in Falls Church, I pointed out to DeeJay that there were no neighbors close by. When the baby cried, we let him cry. By the third night home he was sleeping through peacefully.

When I returned to my job at the Bureau of Ships, I found some changes. The War Damage Analysis Section was no more. Ernie Holtzworth had gone on to greater things. However, as John Niedermair explained to me, I was not destined to go back to the Ship Design Section. A new section was being formed. It was to be called the Atomic Warfare Defense Section. Its mission was to interpret the lessons of Crossroads and recommend design changes in the ships that would be built during the nuclear age. I would be the naval architect in this new section.

Analyzing the Base Surge

One of the complications of the new job was that virtually everything connected with the atomic bomb was classified for security reasons. The bomb had been developed by the Manhattan Project in great secrecy. That policy continued unabated after the end of the war. I had a Secret clearance issued when I worked on the Acorn Seven project during the war. It was now needed so I could look at my own notes from Crossroads.

They set up the new section in a room with a locked door down the hall from the double doors leading into Preliminary Design. To my great delight, I found that "Muddy" Waters had been assigned as Officer-in-Charge. The other professional in the Atomic Warfare Defense Section was Rudolph Langer, a PhD physicist wearing the uniform of a Lieutenant Commander. Picture a room 20 feet wide by 30 feet long with the locked door to the hall at one end and windows at the other. Along the side walls were locked file cabinets and in one corner my drafting table. Picture two government-issue desks pushed against each other so that Muddy and I sat facing each other across the two desktops. Sitting with his back to the windows at a desk pushed against the ends of our desks was Rudy Langer. On the end near the door was the secretary's desk. This was a close-coupled arrangement. Each of us could pass a piece of paper to any of the others without leaving our seat.

In the beginning, I was busy writing the report of air blast damage to the ships at Crossroads. I finished it by Christmas of 1946. It was not an earth-shattering report even though it was classified Secret. At the same time, I worked at home on the article I planned to send to the Naval Institute. It was not too late to submit the paper in the 1946 Prize Essay Contest. Muddy Waters gave me encouragement and helped get the article cleared by the Navy for publication. I didn't win the prize again but the article, "The Navy and the Atomic Bomb," was accepted for publication in February 1947. Eventually it was the lead article in the October issue of the Proceedings.

During the spring of 1947, some of the results of the radiological measurements on the ships at Bikini began to come in. I read the physics books in Dr. Langer's bookshelf and picked his

brains in an effort to educate myself in an area that I knew would grow in importance. I remained dubious about the role of the base surge from the underwater burst in contaminating the target array. On the other hand, the alternative was to believe that the distinguished scientists at Operation Crossroads really didn't know that what goes up must come down. I laid out a plot of the target array on my drafting board and began to plot the raw measurement data. I wasn't quite sure what I was looking for but I knew what it was when I found it. *Some of the ships showed higher readings than ships closer in to the burst.* This should not have occurred if the base surge was the contaminating mechanism. I called the anomaly to Muddy's attention. After some discussion, we decided to pursue the matter further. We needed the film badge data from the target ships, which would give us the total radiation exposure to compare with the contamination measurements. The film badge data for some reason were Top Secret. So we applied for a Top Secret clearance. Meanwhile, I began to refine the contamination data by adjusting to a common measurement time.

In April 1947 son Chris was a year old. DeeJay and I thought he was the most beautiful baby in the world. Naturally, we took pictures. Muddy Waters also was married and had a son of about the same age. Weekly, we would exchange pictures and regale each other with tales that only a proud father would tell. Dr. Rudy Langer could not avoid listening to this babybabble and looking at the pictures. But Dr. Langer was undemonstrative and above all this. In retrospect, I realized that we knew nothing about Langer, not even if he was married. I presumed that he was not. But later that year DeeJay came home one Saturday afternoon with an astonishing story. While shopping, she had met a young woman with whom she used to work at the Navy Department during the war. In the course of conversation, she discovered that she was married to Dr. Rudolph Langer and that they had *three* young children! At the time, Rudy had left us. I told Muddy Waters the story and we both shook our heads. How could any man with young kids remain silent while his coworkers were bragging about theirs?

All that summer I worked on the contamination patterns from the Crossroads underwater shot. I obtained dozens of photographs of the event: the luminous bulge, the white stem of water rising, the cauliflower cloud forming, the base surge at the foot of the collapsing column and the pendulous plumes dropping down from the cloud onto the ships in the target array. Some amateur photogrammetry proved that the location of these plumes matched the areas of high contamination measurements. I was convinced that most of the contamination came from the cloud fallout and not from the base surge. (I liked the word 'fallout' and was one of the first to use it.)

At home I spent the summer writing for an encyclopedia. In May I had received a letter from Crowell Collier announcing that they were producing a new fourteen volume encyclopedia of about ten million words. On the recommendation of Dean W. Selkirk Owen, I was being asked to write an 8000 word article on Naval Ships at two cents a word, due in late September. Good old Windy! I accepted. It wasn't the \$160 only, it was the recognition that went with contributing to a well-known encyclopedia.

Labor Day 1947 came and went. The Top Secret clearance seemed bogged down somewhere. Finally it arrived on the third of October. I requested the film badge data. Later that month my essay, *The Navy and the Atomic Bomb*, was published in the *United States Naval Institute*

Proceedings. It was the first to interpret the Crossroads tests in terms that the fleet could use. The film badge data arrived. It confirmed my analysis of the contamination measurements. Moreover, by analyzing those target ships that were not under a fallout plume but were enveloped by the base surge, I concluded that over 90 percent of the radioactivity had come from cloud fallout and less than 10 percent from the base surge. We put the report to bed in January of 1948 and it was distributed as a Bureau of Ships classified report in March of that year. It bore one of my typical grandiose titles: *Investigation of the Gamma Radiation Hazard Incident to an Underwater Atomic Explosion*.

Death of a Tough Lady

On April 9, 1948, I was 30 years old and things were coming up roses. My son, Chris, was a healthy two-year old. We lived in an elegant new house (see below) and my wife was heavy with our second child. The only fly in the ointment was that I was bored at work. Now that the Bikini fallout study was complete, there didn't seem to be much to arouse the creative juices. I guess I didn't hide my attitude because shortly Muddy Waters invited me to accompany him to John Neidermair's office. "Jerry," said John, "I have a special assignment for you. You are to accompany Commander Waters to Hawaii to assist in carrying out a joint test at sea with the Air Force. The Air Force has a new experimental bomb that they want to test against the old *Nevada*. You know that ship from Bikini days. Review her plans so you can get around inside her by the light of a battle lantern."

Within a few days we were on a Navy bus to Patuxent Naval Air Station in southern Maryland where we boarded a DC-3 operated by NATS, the Naval Air Transport Service. We puddlejumped across the country—Dayton, Olathe KS, Salt Lake City, and finally to Moffat Naval Air Station at the foot of San Francisco Bay. As we drove up the Peninsula toward San Francisco, I marveled at the lush vegetation, the palm trees and the mountains as a backdrop. It looked like a very nice place to live.

Our first stop was the San Francisco Naval Shipyard where we were to visit the Naval Radiological Defense Laboratory (NRDL), a new organization less than a year old. The Bureau of Ships was one of the chief sponsors of the RadLab, as they called themselves. Muddy's uniform got us through the Marine guard at the gate where inquiry directed us to Building 251 on the shipyard map. Building 251 was a modest one-story frame building with a porch and two wings. There we met the Officer-in-Charge, Commander Jack Fee, whom Muddy knew from Annapolis days. After the usual service chit-chat, Jack Fee acknowledged that he had read my report on the Bikini fallout and base surge and had liked it. I sensed that I had achieved a measure of credibility in a field that tended to be closed to all but the academic insiders. We talked about the difficulties of recruiting topnotch scientists for a new government laboratory. CDR Fee told us that his Scientific Director was Dr. William H Sullivan who came from Oak Ridge, one of the laboratories involved in the making of the atomic bomb. "H is his middle name, not an initial," said Fee, smiling, "so you don't put a period after it." He mentioned other key scientists that had signed on and were now at work in some half-dozen buildings scattered around the shipyard. But the main subject was funding. Fee announced that he had received commitments from the Bureau of Yards and Docks and the Bureau of Medicine and Surgery to join the Bureau of Ships in supporting the research effort. He admitted that mighty little had been

published so far by the fledgling laboratory and such that had been published was so technical that he had trouble understanding its significance. When we left, we drove past the *Independence* moored to an isolated pierhead. The contaminated ship had been towed back from Bikini Atoll, contamination and all, to be available for RadLab research. There was nobody near it.

The next morning we flew to Honolulu. How do you fly all the way to Hawaii when there are no nonstop commercial flights across the mainland? Why, you take the Pan American Clipper, that's how. The huge flying boat left from a pier in Oakland, across the Bay. The aircraft had two decks. The upper deck was for first-class passengers. We went down to the lower deck. "Would you like the window seat?" inquired Muddy, as we found our seat row. "Yes, thanks," I replied and slid in. I noted that the water of the bay was about a foot below the bottom of my window. As we taxied down to the foot of the Bay for takeoff, the waves occasionally washed greenly over my window. Let's get out of here, I thought.

The boat turned. The four huge motors roared into full life. We began to go faster. As the plane planed, there was a terrible pounding and wracking by the waves. I gripped the seat arm and prayed. Suddenly, there was a huge explosion and I saw flames immediately outside the window. I was frozen with shock. "JATO bottles," said Muddy. JATO meant Jet Assisted Take Off, a wartime development. I noticed that there was no more pounding by the waves. We were airborne. "You knew that was going to happen," I said accusingly. "No, really I didn't," said Muddy as we settled back for the long ride to Honolulu.

We were met at Honolulu and whisked to a VOQ (Visiting Officers Quarters) at Pearl Harbor to deposit our bags, then to a meeting at Pacific Fleet headquarters. We met several naval officers and two officers in the light blue uniforms of the U.S. Air Force, which had become a separate service the year before. We were briefed on the mission. The Air Force had a new "shaped charge" bomb that they would like to test against armor plate. The Navy had an old contaminated battleship. The *Nevada* would be towed out directly south from Pearl to the deep water. The Air Force would fly out from Hickam AFB and drop the experimental bomb on her. Now, the shaped charge munition was the principle behind the bazooka, which had been used in the war to pierce the armor of tanks on the battlefield. The bazooka worked on the discovery that if one created a cavity in one end of a cylindrical explosive charge and detonated the explosive from the other end nearly all of the explosive force and gases would be channeled along the axis of the cavity instead of exploding in all directions, sort of like a laser beam, I guess.

The experimental plan called for an inspection of the ship after a hit to see how far the bomb explosion was able to penetrate the armor. Guess who would make the inspection? Muddy and I, that's who. Why me, O Lord? Because that battleship was contaminated with radioactive fission products. These officers were not exactly afraid to board the *Nevada* but they felt it was a job for the experts. I was now an atomic expert because I had been at Bikini. And I knew ships. So did Muddy.

That evening I stood on the veranda of the Officer's Club drinking a martini and watched two seagoing tugs nudge the *Nevada* with her gaudy coat of red lead away from Battleship Row and out to sea. The next day we boarded a destroyer and followed the *Nevada*. After an hour or two of steaming, the red battleship hove in sight. I was beginning to get a feeling of kinship with this

old friend from Bikini, an atomic bomb survivor. We took station a few thousand yards off the port bow. About an hour before noon, the Air Force arrived, made a practice run and dropped the first experimental bomb. It was a near miss. The next one struck squarely on top of Number Two turret. It did not create much of a display but enough to indicate that the weapon had functioned. A thin stream of smoke issued from the top of the turret. Muddy decided that we would wear RBAs (Rescue Breathing Apparatus.)

I got a hurried training in the use of an RBA, which was rather like scuba gear. One wore a mask and a tank of oxygen so one wouldn't need to breathe the environmental air. We boarded the *Nevada* and made our way to the top of Number Two turret. There was a neat three-inch hole in the 5-inch turret armor. I poked my measuring tape down in the hole. It went all the way through. Muddy and I looked at each other. We climbed down from the turret and went under the rear overhang where we undid the hatch used to enter the turret. A small amount of smoke escaped. We donned our RBAs, turned on our battle lanterns, and climbed up into the turret. A battleship turret with its huge 14-inch guns is quite a tight place to inspect. We looked up at the hole and estimated its trajectory. It was directly over the starboard gun breech. Sure enough, a three-inch hole chopped down through the whole gun, about 18 inches, most of it steel.

We followed the trail of that molten steel down through a shell handling tray, a wiring harness, and the floor of the turret. We did not find the source of the smoke we had seen. We left the turret, compared notes, went down one deck and into the munition elevator room servicing the turret. The hole went through there, chopping everything in its path. We continued down seven decks to the magazines where the powder would be stored if the ship were armed and ready. There was a hole in the overhead and a coil of burnt rope smouldering on the deck.

Back on the destroyer, we reported our findings. That one hit would have blown up the ship. With a bomb like that who needs atomic weapons? I don't know whether today's "smart bombs" use shaped charges but I wouldn't doubt it.

After lunch, we returned topside to watch the next act. A flotilla of five or six cruisers filed along the horizon and used the *Nevada* for target practice. This was the fleet that had been battling the Japanese navy in the Philippine Sea less than three years earlier. They were pretty good. The superstructure was wrapped in smoke and flashes as the projectiles exploded. But the armor of the *Nevada* was too much for these 6- and 8-inch guns. After several hours of bombardment, the destroyers were sent in for the kill. They dropped their fish and heeled away. The torpedoes ran true. One, two, three huge guysers, then four and five. The tough old lady in the red dress wallowed, sagged by the bow, and slipped under.

Making It in Real Estate

The house on Winchester Way in Falls Church was our initial investment in real estate—our first home of our own. It was a Cape Cod bungalow as they build them in Virginia. On a goodly sized lot, it was 30 feet across the front and about 22 feet deep. The front door was centered with a generous window agreeably balanced on each side and similar windows in dormers on the roof above. The siding was grey shingles (asbestos, asphalt, fiberglass, or whatever.) There was no garage or carport, just a driveway on the right side of the house that terminated at a side door that

led into the kitchen. When one entered the front door, one was immediately in the living room, which was about 18 feet by 12 feet. One entered near the wall separating the living room from the master bedroom. Directly across was a hallway and the door to the bathroom. One turned left in the hall to the two bedrooms. At the other end of the living room was an arch to the kitchen. Beyond the kitchen, in a little ell extending from the rear of the house, was a dinette or breakfast room.

We bought that house in 1944, during the war, for \$7,250. It had been built in 1941 just before Pearl Harbor. We gradually furnished the house with loving care. By the time of the Bikini tests, the inventory sheets that the renter, Major Davis, signed were four pages long. After I returned from Crossroads, DeeJay decided that real estate was her game and before I knew it she had her license as a real estate agent. One reason for her enthusiasm was that real estate for agents was primarily a weekend occupation, which meant that she took care of Chris on weekdays and I took care of him on weekends. "Houses in good locations are in demand right now," she told me. "This is an excellent location but the house is too small. Let's fix it up and put it on the market."

Winchester Way was a natural for fixing up. In the hallway off the living room was an enclosed stairway leading up to the unfinished attic. The stairway was directly over the stairway that led from the kitchen down to the full basement. The attic, of course, had two dormer windows. I laid the flooring in the spring of 1947 and installed a stud wall across the middle of the attic to form a third bedroom over the downstairs bedrooms. The part of the attic containing the stairwell became a "sewing room." A little drywall, trim, doors, and paint completed the transformation of the attic into the "upstairs." There even was room for a bathroom over the one below although we never got to install the plumbing for it.

The kitchen was a problem area. It was rather small and got daylight only from the arch to the dinette and from glass in the upper part of the side door. We decided to rip out the wall between the kitchen and the dinette. Because it was a bearing wall, really the outside of the house if the ell hadn't been there, I had to leave a post where the inside of the arch had been. Not to worry. We installed cabinets and a counter top where the wall had been, then an open oriental-style lattice above the counter so that light from the dinette windows flooded the kitchen. We hung plants in the lattice and papered the ceiling with cabbage roses. Voila! A lovely country kitchen.

"Let's put it on the market for \$15,000," said DeeJay. "\$15,000!" I shouted. "You're out of your mind! That's more than twice what we paid for it. It will never sell." We put it on the market a little after Labor Day, 1947. I thought we had plenty of time especially since only a few people came to look at the house. We had purchased a nice lot in a new subdivision on Ravensworth Road in Annandale. We had started talking with the developer about building a house on that lot. (We also were given a German Shepherd puppy to keep Chris company—a puppy we named Igor.) Then kazamm! We got an offer we couldn't refuse, \$13,650, in early October. By mid-November, our furniture was in storage and we were rich in the bank account but poor in accommodations. Short-term furnished rentals were not easily come by when you had a baby and a dog. Oh yes, and DeeJay began having morning sickness.

Building a house on our lot in Annandale would doom us to half a year or more of this sort of thing. We contracted with the developer for a house in the same subdivision that was already

under construction. The Christmas holidays came and went. The winter was unusually severe and construction dragged. We cancelled out and DeeJay went househunting. Finally, on March 1st, 1948, we moved into 2016 North Powhatan Street in Arlington, a new two-story brick side-hall colonial that cost us \$18,000.

At the Real Crossroads

All the above travail occurred at home while I was deep in the analysis of the radiation hazard at Crossroads Baker. In fact, my opus was finally published the week after we moved into North Powhatan Street. We loved that house. It was elegant. Our daughter Cynthia was born on June 15, 1948, at the new George Washington University Hospital. She, like Chris, was a healthy, beautiful child. We were ecstatic except that Igor the dog had taken ill and unaccountably died the day Cyn was born. And before the month of June was out, John Niedermair called me into his office and made me another offer I could not refuse.

“You are familiar with NRDL, aren’t you,” he asked. He knew very well that Muddy Waters and I had stopped by there on our way to Hawaii. “There is a job opening there you might be interested in. It’s a P-5 as head of a new Engineering Applications Branch.” It further developed that the Bureau chief was concerned that the investment in the RadLab wouldn’t be fully used unless there was an organizational element in the laboratory concerned entirely with practical applications of the emerging knowledge on radiation and contamination by fallout. I had been suggested for the job. This offer was a wholly new idea to me. I had jumbled feelings about it. “How soon would I be expected to report,” I asked. “At your convenience,” replied John, “but before the end of the year.” The Fourth of July weekend was coming up. “Take a day or two to decide,” said John.

I returned to my desk and stared at the ceiling. All the career signs said “go.” The job was a P-5 (now a GS-12), the first step into the supervisory hierarchy. My job title would be Supervisory General Engineer. If I stayed where I was, it would be at least another ten years before I could aspire to that level. Maybe longer. Someone was going to take that job and when he did the Atomic Warfare Defense Section would be superfluous. Muddy Waters would go on to something greater and I would go back to the drafting board.

All the other signs said “no.” I had a brand new baby daughter. We had just moved into an elegant brick house in the Overlea Knolls section of Arlington. DeeJay had just entered the real estate business with Barry Weetman Realty. We had all our friends back here. Our two families, our kids’ grandparents, were not too far away. California was a long way away. And I realized that I was at a real crossroads in my life—our lives. We would be leaving the known and comfortable for the unknown and strange. How did I know I could even supervise? In the end, it was the challenge that enticed me.

I went back to John’s office and told him I would accept the offer. I then drove home to our elegant Arlington home. My lovely spouse was feeding our new daughter. Chris, a toddler, was at her knee. It was a scene worthy of Norman Rockwell. “Start packing,” I said, “We’re moving to California.”